Center for Electronic Materials, Devices, and Systems (CEMDAS)

The University of Texas at Arlington and Texas A&M University

Electronic materials growth technology, characterization and modeling of advanced electronic and electro-optic devices

A National Science Foundation Industry/ University Cooperative Research Center since 1995

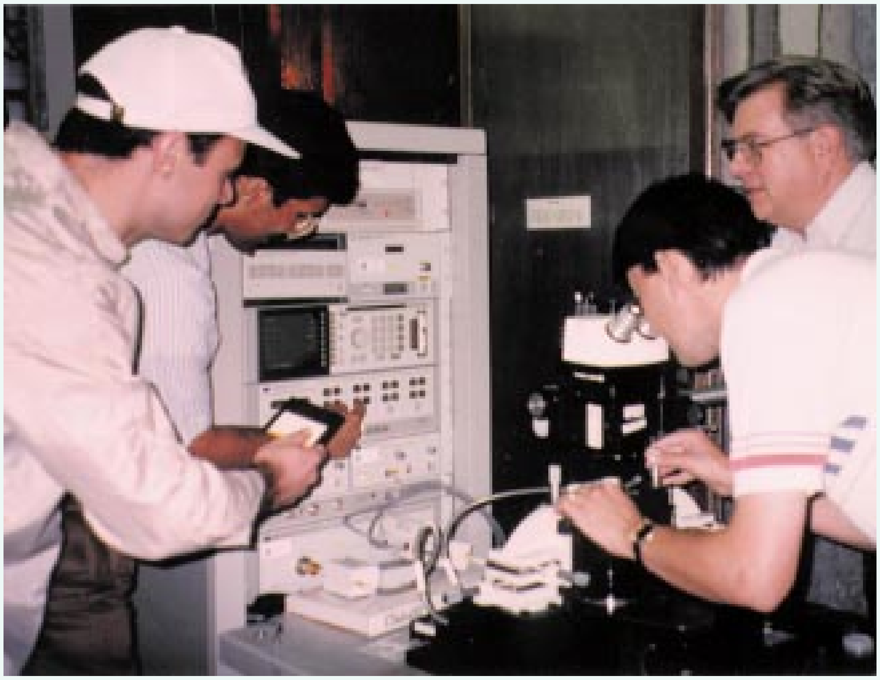
Center Mission and Rationale
The Center for Electronic Materials, Devices, and Systems (CEMDAS) was established to advance the technology and application of broadband, high frequency solid-state devices and the material growth technology.

The Center was formed from the consolidation of two existing research centers: the existing I/UCRC at The University of Texas at Arlington (UTA) and the Electronic Devices and Materials Group at Texas A&M University (TAMU). This consolidation combines the advantages of a large metropolitan university located in the heart of the Dallas-Fort Worth metroplex with a traditional major research university.

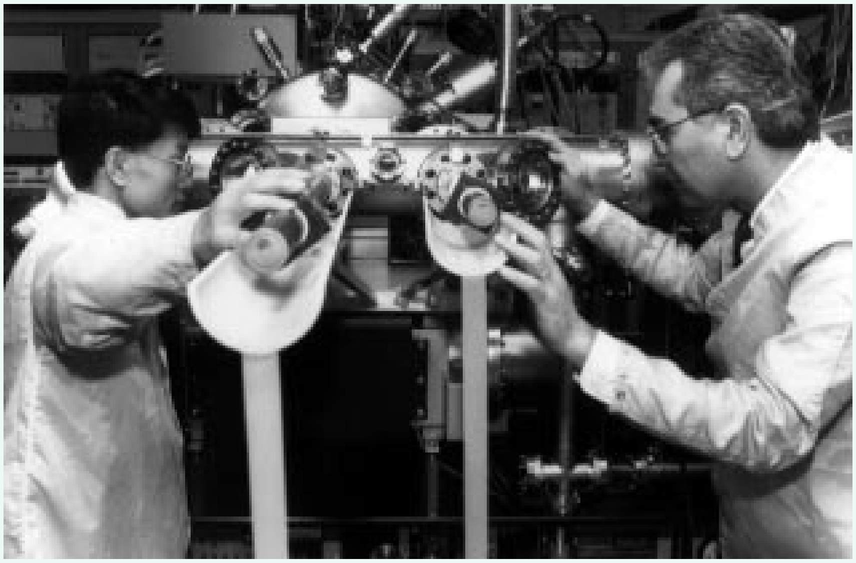
Research Program
Topics to be addressed by the Center are those associated with advanced electronic and optical systems that support the high-technology infrastructure for communication, transportation, and information processing. The expertise of the consolidated Center covers modern electric materials, electronic and electro-optic devices, and systems analysis.

The Center has particular expertise in bulk single-crystal and thin-film growth, characterization, and process modeling of electronic materials; molecular beam epitaxy (MBE) for the production of multilayer devices and heterostructure devices; thin film and rapid thermal processing; fabrication and evaluation of devices; devices modeling; and simulation. Design, fabrication, and testing of broadband, high frequency planar solid-state devices and circuits is done through alliances between the university and our industrial partners. A strong service and educational component of the Center is to provide the know-how and the appropriate interfaces for students and other universities to access these services.

The Center will provide a combined capability that allows the integration of design, analysis, fabrication, and testing of systems, incorporating everything from the materials used to systems considerations. Research and technology transfer will be performed with the close cooperation of the Industrial Advisory Board, which is composed of all the Center's industrial members.



On-wafer measurements of devices are made in the Center's Microwave Laboratory.



Gallium arsenide wafers for epitaxial growth are transferred into the Varian GEN II Molecular Beam Epitaxy growth chamber.

Several technical facilities are available at the Center, each containing specialized equipment. At TAMU, there are the Crystal Growth, Thin-Film and Characterization Lab, the Electro-optics Lab, and the Microwave Lab, equipped with crystal growth furnaces, electro-optics, and semiconductor laser instrumentation. At UTA, there is a class 10/ 100 GaAs processing clean room with Karl Suss UV aligner, Heatpulse rapid thermal processor, Varian e-beam evaporator, and MRC sputter deposition system; a molecular beam epitaxy facility with Varian GEN II modular molecular beam epitaxy system, Auger analysis and photoluminescence system; and a microwave facility with HP 8510 and Hughes automated microwave network analyzers (45 MHZ to 60 GHz, and 90 – 100 GHz), time domain reflectometry, and cascade wafer prober.

Current Center Activities

In the materials processing, characterization, and applications area —

- Applications of PIN multiple quantum well structures in optoelectronic devices
- Development of non-volatile, high-density memory based on superconductor-ferroelectric integrated structure
- High-performance uncooled IR detectors based on pyro-optic effect
- Non-spiking ohmic contact schemes on InGaP and AlInP
- Development of microwave resonators, filters, and delay lines based on BCSCO superconductor films
- Development of photorefractive KTN and KN for optical computing
- Non-stoichiometric GaAs grown at low temperature by MBE.

In the optical devices and instrumentation area —

- Modeling and analysis of surface-emitting double heterostructure AlGaAs/GaAs LED
- Nonlinear electro-optic devices
- Fiber-optic temperature sensor development
- Integrated optics
- Development of an optical-homodyne frequency domain reflectometer.

In the microwave and millimeter-wave device area —

- Narrow-band dielectric microwave mirrors
- Millimeter spatial power combiner
- Wideband microwave delay lines and baluns.

In the design, simulation and system integration area —

- ESD protection devices for GaAs MMIC devices
- Low-power GPS receivers
- Low-observable microwave antenna
- HBT computer-aided design models

Semiconductor laser below the eye of a needle

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